PHASE TRANSITIONS AND DIELECTRIC RELAXATION IN $Ba_{1-x}Pb_x(Ti_{1-x}Li_x)O_{3-3x}F_{3x}$ FERROELECTRIC CERAMICS .

Laldja BENZIADA – TAÏBI[1] , Jean RAVEZ [2]

[1] *Institut de Chimie , U . S . T . H . B ., B. P. 32 El-Alia , 16111 BAB-EZZOUAR , Algeria*

[2] *Laboratoire de Chimie du Solide du C . N . R . S . , 33405 TALENCE , France*

Perovskites ABO_3 have numerous properties and are attractive materials for several applications. Their relatively simple structure allows to control and to modify the ferroelectric characteristics varying ionic substitutions in A-site or B-site. The aim of this work is to lower both the sintering and the Curie ferroelectric temperatures of $BaTiO_3$ using the fluoride mixture PbF_2 + LiF. Various compositions (1 - x) $BaTiO_3$ + x PbF_2 + x LiF were prepared and heated at 1203 K for 2 hours. The purity and the symmetry of the obtained samples were checked by X-ray diffraction. A new solid solution with general formula $Ba_{1-x}Pb_x(Ti_{1-x}Li_x)O_{3-3x}F_{3x}$ occurs in the $0 \leq x \leq 0.20$ range. Cold-pressed pellets were then fired at 1203 K for 2 h. Heating and sintering were performed in sealed gold tubes to prevent any hydrolysis. Final relative densities of 96 % were achieved for some ceramics and the grain average sizes were about 5µm. The complex permittivity was measured as a function of temperature (150 K ≤ T ≤ 450 K) and frequency (50 Hz ≤ f ≤ 4 .10^7 Hz). The dielectric performances are the highest for ceramic with composition $Ba_{0.97}Pb_{0.03}(Ti_{0.97}Li_{0.03})O_{2.91}F_{0.09}$. The real component ε'_r exhibits a maximum of approximately 7500 at the ferroelectric Curie temperature Tc = 255 K, the dielectric losses tan δ value being 0.012. At room temperature, the relaxation frequency f_r was found to be around 40 MHz for this ceramic. At low frequencies, this new ferroelectric oxyfluoride with diffuse phase transition may be promising material for applications in particular in the field of Z5U multilayer capacitors.

9th International Conference on Modern Materials and Technologies (CIMTEC'98), FLORENCE, Italy, June 14 – 19, 1998